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Monetary Policy, Fiscal Policy, and Aggregate Economic Activity in Korea

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MONETARY POLICY, FISCAL POLICY AND AGGREGATE ECONOMIC ACTIVITY IN KOREA

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I. Introduction

In a recent article in this Journal, Kwon (1985) has shown that changes in real government spending exert a significant influence on real income in Korea. He also found evidence showing a positive relationship between the growth rates of real money supply and real GNP. This led him to reject the neoclassical notion that money is neutral in case of Korea. However, his conclusions are based on a simple comparison of the growth rates of real income and the monetary and fiscal policy variables during the sample period 1965-80. It is possible that what he found was the presence of a high degree of correlation between the real income and each of the two policy variables. Correlation doesn't imply causation. The similar trend evident in these variables may be caused by another variable not included in his study. Hence any policy inferences based on the conclusions of Kwon's study may suffer from bias due to the absence of any systematic statistical analysis.

The aim of this paper is to test the comparative effectiveness of monetary and fiscal policy variable as a stabilization tool in Korea. The results can then be used to test the robustness of Kwon's conclusions. Korea represents a small open economy which has achieved remarkable economic growth over the last twenty years. The monetary management decisions in Korea are taken by the Bank of Korea. However, unlike many developed countries, the Bank is directly controlled by the government. The fiscal decisions are also unilaterally taken by the executive

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branch of the government with little or no input from the legislature.

The methodology used here is the modified St. Louis equation proposed by Batten-Hafer (1983) and Darrat (1984). In the original St. Louis equation, nominal income is regressed on distributed lags of a monetary and a fiscal policy variable. However, even though this single equation approach has been frequently employed to analyze the macro effects of monetary and fiscal policy actions, the approach has been subjected to much criticism. (See, for example, deLeeuw-Kalchbrenner (1969), Goldfeld-Blinder (1973), Modigliani-Ando (1976)). Hence in order to remove some of the weaknesses inherent in the original equation and also to make the equation more representative of a small open economy like Korea, the following modifications are suggested for the St. Louis equation.

First, as the original St. Louis equation was formulated to test the relative effectiveness of monetary and fiscal actions, it doesn't incorporate all of the exogenous forces that affect GNP. Batten-Hafer (1983) have argued that if the missing exogenous variables are policy variables or closely correlated with the variables representing monetary and fiscal actions, their omission may lead to a serious statistical problem. This would be more so for a country like Korea given its large degree of openness. Exports and imports account for a large proportion of its GNP. Monetary and fiscal actions obviously affect the foreign trade sector leading to a high degree of correlation between external and domestic influences on economic activity in Korea. As a result, a variable representing these external influences should be included in analyzing the comparative effectiveness of monetary and fiscal policy actions on Korean GNP. Second, a growth-rate version of the equation is estimated rather than the original first-difference form. This helps to resolve the problem of heteroscedasticity. Third, the original St. Louis equation is estimated with each distributed lag's coefficient restricted to lie on a fourth-degree polynomial with zero endpoint constraints. Instead of subjecting the data to such potentially invalid polynomial restrictions, the study aims at estimating a reduced form equation using unconstrained ordinary least square (OLS) method. The optimal lag length of each variable is determined on the basis of the minimum final prediciton error criterion as discussed in Hsiao (1981).

Section II describes the model and the empirical results while Section III contains the results of dynamic simulation and stability tests. Section IV gives a summary and draws some conclusion.

II. Model and Empirical Results

In recent years, many summary measures of monetary and fiscal policy have been developed. The major reason for searching for such a measure is to provide a quick interpretation of current policy stance. In case of Korea the narrow money supply (M1) is used as a measure of monetary policy actions since it reflects more accurately changes in the instruments of policy. Fiscal policy actions are measured by total government expenditures. Net exports are used to represent the foreign trade sector.

The modified St. Louis equation to be estimated can be written as

$$\dot{Y}_t = C_o + \sum_{i=0}^{j1} m_i \dot{M}_{t-i} + \sum_{i=0}^{j2} f_i \dot{F}_{t-i} + \sum_{i=0}^{j3} e_i \dot{E}_{t-i} + U_t \qquad (1)$$

where $\dot{Y}$, $\dot{M}$, $\dot{F}$, and $\dot{E}$ represent the growth rate of real income, real narrow money supply (M1), real government expenditures and real net exports, respectively; c_i, m_i, f_i, and e_i are the coefficients to be estimated and U_t is the error term. Equation (1) is estimated using quarterly data for the period 1966-1984. The time series data has been taken various issues of International Financial Statistics published by the International Monetary Fund.

The regression results are given in Table I. The regression seems to fit the data well. An $\bar{R}^2$ value of 0.78 shows that the explanatory variables explain most of the variations in the growth rate of real income. After correcting for first order serial correlation, a Durbin-Watson Statistic of 2.04 indicates the absence of any remaining serial correlation in the residuals. Using the minimum final prediction error criterion, the optimal lag length for the variables M, F and E is calculated to be 6, 3 and 8 respectively. Coefficients of all three variables have the expected positive sign. This implies that changes in these variables have a positive impact on real income. The absolute value of the cumulative impact of money supply growth is 1.23 and appears to be significant at the 5% level. On the other hand, the absolute value of the cumulative impact of government expenditures is only 0.305. Moreover, it is not significant even at the 10% level. This suggests that monetary actions exert a significant effect on economic activity in Korea, while fiscal actions have no statistically significant influence. This contradicts the results of Kwon

Table I

Regression results from the modified St. Louis Equation for Korea: 1966-84

Lag (i)	Constant	M	F	E
	1.20			
0		0.142 (2.04)	0.087 (0.56)	0.076 (2.06)
1		0.094 (1.92)	0.036 (0.15)	0.094 (1.42)
2		0.224 (3.76)	0.104 (1.45)	0.202 (2.32)
3		0.268 (2.12)	0.078 (0.68)	0.008 (1.87)
4		0.099 (1.03)		0.088 (2.02)
5		0.164 (1.44)		0.004 (0.55)
6		0.239 (3.06)		0.065 (1.36)
7				0.178 (2.77)
8				0.101 (1.82)
		1.230 (2.76)	0.305 (1.04)	0.816 (2.44)

$\bar{R}^2$ = 0.78
D.W. = 2.04
RHO = -.411

The figures in parentheses are absolute values of t-statistics.

(1985) and shows the limitations of his findings which are based on a simple comparison of the growth rates of real income and the two policy variables. The above results are also contrary to the findings of Pandit (1977) and Atesoglu-Tillman (1980) for Korea. Pandit's study showed that the fiscal and the monetary policy variable performed equally well in explaining short-term changes in aggregate economic activity in Korea; while Atesoglu-Tillman's results suggest that the direction of causality runs from autonomous expenditures to income whereas neither narrow nor broad money supply cause income in Korea.

It is interesting to note that the growth in net export appears to play an important role in explaining real GNP growth. The net export coefficient has the expected positive sign and is significant at the 5% level. The absolute value of the coefficient is also quite high. Hence it can be safely argued that any study attempting to explain changes in the economic activity in Korea should include a foreign trade variable as one of the explanatory variables. In the absence of such a variable, the regression results may suffer from bias due to an omitted variable.

Darrat (1984) has shown that the relative predictability of fiscal and monetary impacts on income can be judged by the relative size of the t-statistics of the corresponding sum coefficients. Table I shows that the t-statistic for the monetary summed coefficient is significantly higher than the t-statistic for the fiscal summed coefficient. This suggests that the actual and the estimated relationship between real income and real money supply is more likely to have the same sign than such relationship between real income and real government expenditures.

The relative strength of the impact of government expenditures and M1 can be compared by calculating their beta summed coefficient. For either policy variable, this coefficient represents the product of the estimated summed coefficient and the ratio of the standard deviation of that policy variable and real income. The beta summed coefficients are estimated to be 0.184 (significant at 10% level) for government expenditures and 0.322 (significant at 1% level) for M1. This further indicates that monetary actions dominate fiscal actions in explaining movements in real GNP growth.

III. Dynamic Simulations

The estimated equation can be used to analyze the effects of changes in the growth rates of the policy variables on the growth rate of income. This is done by estimating dynamic multipliers using dynamic simulations. Initially, a base dynamic simulation using historical data for all variables is performed. Then a dynamic simulation is run with the growth rate of an impulse variable, say, M1 increased by 1% above its historical values; historical data are used for the other variables in the equation. The difference between the base simulations and the policy simulations gives an estimate of dynamic multipliers for M1. The same procedure is applied to calculate dynamic multipliers for the fiscal policy variable. These multipliers are of interest to policy makers because they describe the effects and timing of policy variables on the variables of ultimate concern. The results are presented in Table II.

The figures in each column represent the responses of income at the indicated period (in the column headed by period) to a one percent change to the variable in the heading of the column. The responses are expressed in percent of changes. Responses for selected periods are reported here. A 1% increase in the growth rate of the fiscal policy

Table II

Dynamic Multipliers for Real Income Growth

Period	F	M
1	0.30	0.76
2	0.38	0.58
3	0.22	0.30
4	0.12	0.28
8	-0.03	0.20
12	-0.06	0.08

variable initially raises income. The peak effect occurs in the second quarter when a 1% change in government expenditures lead to about 0.4% change in income. However, the effect gradually declines and at the end of the fourth quarter becomes small. Interestingly, the effect is negative in the second and third year. This provides some evidence of a 'crowding out' effect. Suppose the government finances additional expenditures by issuing bonds. As interest rates are sensitive to changes in the supply of bonds, the long-run expansionary impact of increased government expenditures are fully offset by negative net wealth and substitution effects on private investments. As a result, expansionary fiscal policy eventually lowers income by crowding out private investments.

In contrast, a 1% increase in the growth rate of M1 has a significant impact on income for a considerable period of time. The peak effect occurs in the first quarter when a 1% change in M1 leads to about 0.8% change in income. The effect declines substantially in the second and third quarter and stabilizes somewhat in the fourth quarter. During the last two years reported, the effect gradually becomes smaller. In short, the immediate effect of 1% growth in both the monetary and fiscal policy variables on real income is significant. However, the magnitude of the effect is much higher in the case of a growth in M1 than in government expenditures. The long-run effects are also higher in the case of the monetary policy variable.

The reliability and usefulness of the above empirical results for policy purpose depends on the structural stability of the estimated equation. If the regression equation is structurally unstable, then the results will become meaningless for the purpose of forecasting and policy analysis. Hence the structural stability of Equation (1) is tested by employing two widely used tests – Chow (1960) and Farley and Hinich (1970) tests. The Chow test examines the possibility that the estimated equation has undergone a single-point shift; whereas, the Farley and Hinich test examines the possibility of a gradual shift in the parameters during the entire sample period. The empirical power of the Chow test is maximized by splitting the sample period at the midpoint. The relevant F-statistics for the Chow test and the Farley-Hinich test are 1.26 and 1.12 respectively. Consequently, the hypothesis of structural stability cannot be rejected at the 5% significance level. This implies that the regression estimates reported and discussed earlier in the paper are relevant and useful for policy purposes

IV. Concluding Remarks

The purpose of this paper has been to discuss the relative impact of monetary and fiscal actions on economic activity in Korea. A modified St. Louis-type reduced form equation is estimated for the sample period 1966-84. The regression results suggest that growth in the monetary policy variable has a greater impact on changes in real income than growth in the fiscal policy variable. Computation of beta summed coefficients further supports the regression results. The dynamic multipliers of the model suggest that the long-run effects of a change in the growth rate of the monetary and the fiscal policy variables are also different. The effects of a change in the growth rate of M1 on real income last for a relatively longer period of time compared to a change in the growth rate of government expenditures. Moreover, the magnitude of the effect is also greater in case of the monetary policy variable. The estimated equation is also found to exhibit structural stability implying its usefulness for the purpose of forecasting and policy analysis.

References

1. Atesoglu, H. S. and J. A. Tillman, "Money, Autonomous Expenditures, Income and Causality in Korea," *Journal of Monetary Economics* 6, 1980, pp. 527-34.

2. Batten, D. S. and R. W. Hafer, "The Relative Impact of Monetary and Fiscal Actions on Economic Activity: A Cross-Country Comparison," Federal Reserve Bank of St. Louis, *Review*, January 1983, pp. 5-12.

3. Chow, G. C., "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," *Econometrica* 25, July 1960, pp. 591-605.

4. Chowdhury, A. R., "A Note on the Dominant Influence of Fiscal Actions," *Eastern Economic Journal* XII, January-March 1986.

5. Darrat, A. F., "The Dominant Influence of Fiscal Actions in Developing Countries," *Eastern Economic Journal* X, July-September 1984, pp. 271-284.

6. deLeeuw, F., and J. Kalchbrenner, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization: Comment," Federal Reserve Bank of St. Louis, *Review*, April 1969, pp. 6-11.

7. Farley, J. U., and M. J. Hinich, "A Test for a Shifting Slope Coefficient in a Linear Model," *Journal of American Statistical Association* 65, September 1970, pp. 1320-1329.

8. Goldfeld, S. M., and A. S. Blinder, "Some Implications of Endogenous Stabilization Policy," *Brookings Papers on Economic Activity* 3, 1973, pp. 506-532.

9. Hsiao, C., "Autoregressive Modelling and Money-Income Causality Detection," *Journal of Monetary Economics* 7, January 1981, pp. 85-106.

10. Kwon, Ohchul, "Monetary and Fiscal Policies in a Two Sector Model with Imperfect Capital Markets: Some Implications for a Developing Country like Korea," *Asian Economies*, 53, June 1985, pp. 60-86.

11. Modigliani, F., and A. Ando, "Impacts of Fiscal Actions on Aggregate Income and the Monetarist Controversy: Theory and Evidence " in J. S. Stein, ed. *Monetarism* (Amsterdam: North-Holland, 1976), pp. 17-42.

12. Pandit, V., "Multiplier, Velocity and Underemployment," *Manchester School Economic and Social Studies* 45, June 1977, pp. 112-126.

Comments by Dr. Oh-Chul Kwon

In a recent article in this Journal, Professor Chowdhury has concluded that monetary policy is more effective than fiscal policy to influence the growth rate of GNP in Korea. He has also concluded that money is not neutral in Korea. Non-neutrality of money is also found in the study carried out by Kwon (1985). In contrast to Chowdhury's results, Kwon (1985) has concluded that fiscal policy is more effective than monetary policy in Korea.

In general Chowdhury has conducted a significant study in this area especially for the case of a small open economy like Korea. However, there are several points to comment in regard to Chowdhury's empirical work.

Since the late 1970s, the relationship between the money supply and GNP has deteriorated sufficiently to suggest that the formerly reliable correlation between the money supply and GNP may have become highly unstable. Over the past six years, year-to-year changes in the velocity of money have become very volatile. At the same time, the simple economic models that so successfully exploited the close link between the money supply and GNP have become relatively unreliable tools for forecasters and policymakers.

As we all know, the St. Louis approach has its share of potential weaknesses. Foremost among these is the assumption that the measured money supply determines that subsequent flow of GNP. In other words, the direction of causality is unindirectional from the money supply to GNP. However, this assumption is not guaranteed in Korea.[1]

Despite these qualifications, the St. Louis equations do serve a useful purpose. To the extent GNP is related dependably to the money stock and the deficit, the model will forecast well. But when estimating the relationship between one highly autocorrelated variable (GNP) and several different lags of another highly autocorrelated variable (the money stock), the results may be spurious and very unstable, especially

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1. See Kwon (1979), Atesoglu and Tillman (1980).

amplitude of business cycle changes. Consequently the St. Louis equation may appear to do a good job of fitting the data for any interval of time, but its forecasts may break down because the equation may represent only an inherently unstable statistical coincidence.

Chowdhury has modified the St. Louis equation by including the level of net export as an independent variable. Thus the modified equation also contains this problem mentioned above.

Among its other potential weaknesses, a standard St. Louis equation admits no role for foreign trade policies and fiscal and monetary policies adopted by other nations. By the way, Chowdhury inserts net export into the St. Louis equation in an attempt to explain the growth rate of GNP in Korea. I think his idea is excellent especially for the case of a small open economy like Korea.

The problems found in the study done by Chowdhury is as follows. First, as I have mentioned above the modified equation still contains problems existed in the standard St. Louis equation.

Second, Chowdhury simply inserts changes in the level of net export into the St. Louis equation as one of independent variables. As we know, a change in the level of net export is not an exogenous variable. And the direction of causality may not be unindirectional from changes in the level of net export to GNP in Korea. Changes in the level of GNP may cause changes in the level of net export in Korea on the ground that import is a function of GNP. In addition, changes in the level of net export in Korea could be affected by changes in the exchange rate, the price level, and GNP.

Third, there may exist a multicolinearity problem in the Chowdhury's modified equation. As we know, changes in the money supply could be affected by changes in the level of net export in Korea. Thus changes in the money supply and changes in the level of net export could be seriously correlated. Professor Chowdhury should eliminate the multicoliniarity problem in his study. Without correcting the multicoliniarity problem in his study, we are not able to see the relative potency of fiscal and monetary policies in Korea.

Fourth, monetary and fiscal policies adopted by other countries (especially U.S.) should be included in his modified St. Louis equation in order to explain the growth rate of GNP in Korea. There exists a study that explains the fact that changes in the U.S. money supply significantly influence the Korea income.[2]

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2. See Kwon, Oh-Chul, Government Policies and Econometric Practices, Hyungsul Publishing Co., Korea, 1985.

References

1. Atesoglu, H. S. and J. A. Tillman, "Money, Autonomous Expenditures, Income and Causality in Korea," *Journal of Monetary Economics,* 6, 1980, pp. 527-34.

2. Chowdhury, A. R., "Monetary Policy, Fiscal Policy and Aggregate Economic Activity in Korea," *Asian Economies,* Sept. 1986.

3. Kwon, Oh-Chul, "Money, Income, and Causality-The Korea Experience," *Asian Economies,* June 1979, pp. 17-35.

4. Kwon, Oh-Chul, "Monetary and Fiscal Policies in a Two Sector Model with Imperfect Capital Markets," *Asian Economies,* June 1985, pp. 60-86.

5. Kwon, Oh-Chul, Government Policies and Econometric Practices, Hyungsul Publishing Co., Korea, 1985.